



## SPLEEN STIFFNESS IN CHRONIC LIVER DISEASE USING ACOUSTIC RADIATION FORCE IMPULSE IMAGING – A REVIEW

### Radiodiagnosis

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### ABSTRACT

Cirrhosis is the common endpoint of chronic liver disease affecting more than one third of the population all over the world causing significant morbidity and mortality. Complications of cirrhosis include portal hypertension, esophageal varices, variceal bleeding, ascites. Till date screening upper GI endoscopy is used as a prophylactic measure in all cirrhotic patients which also helps in choosing the treatment option that the patient should undergo. However in view of its inherent invasive complications sonoelastography has come in to picture for measuring spleen stiffness which would act as a radiological parameter for early detection of complications associated with chronic liver disease. The aim was to undertake a review about the significance of spleen stiffness measurement as a radiological predictor in chronic liver disease patients. A literature search was conducted using Pub Med and Google Scholar up to January 2020 with the following key words “spleen stiffness”, “ARFI”, “ARFI in spleen stiffness” and “ARFI in cirrhotic liver disease”. A total of 14 studies met the inclusion criteria and were included in the analysis. Based on the results of the study, it can be concluded that spleen stiffness using acoustic radiation force impulse imaging can act as a early radiological predictor for detection of complications associated with chronic liver disease patients.

### KEYWORDS

Elastography , Spleen Stiffness , Arfi ,chronic Liver Disease.

#### INTRODUCTION:

Cirrhosis is a common endpoint of chronic liver disease<sup>1</sup> affecting 1/3<sup>rd</sup> of the population all over the world and its complications include portal hypertension, esophageal varices, variceal bleeding, ascites, portopulmonary hypertension, spontaneous bacterial peritonitis. According to guidelines screening upper gastroesophageal endoscopy is recommended in cirrhotic patients as a prophylactic measure and as it also helps in choosing the treatment option that the patient should undergo.

However in view of inherent invasive complications associated with upper GI endoscopy, sonoelastography has come into picture for measuring spleen stiffness which would act as a valuable radiological predictor for early prediction of complications of cirrhosis. Acoustic radiation force impulse imaging (ARFI) is a ultrasonological software being imparted in B-mode ultrasonography to evaluate the stiffness of an organ in a specific region of interest.

#### METHODS:

Extensive comprehensive search was done in Pubmed and Google scholar with keywords “spleen stiffness”, “ARFI”, “ARFI in spleen stiffness” and “ARFI in cirrhotic liver disease”. All systematic reviews published before November 2019 that evaluated the accuracy of splenic stiffness using ARFI for early prediction of complications of cirrhosis were selected for our review.

#### REVIEW:

In a study conducted by Fierbinteanu et al on 135 cirrhotic patients have found that spleen stiffness is higher in esophageal varices ~3.37m/s than with no esophageal varices~2.79 m/s.<sup>2</sup>

In a study conducted on 178 patients with cirrhosis; ARFI splenic stiffness for predicting esophageal varices for a cutoff value of 2.89 m/s showed sensitivity of 91.4% and for 3.30 m/s showed 96.4%.<sup>3</sup>

In a multicenter retrospective study conducted by Heojy et al concluded that ARFI-spleen diameter-to-platelet ratio scores can access risk of esophageal varices bleeding in cirrhotic patient with score >4.50.<sup>4</sup>

A study conducted by Attia et al and De santis et al concluded that spleen stiffness is superior to liver stiffness and can be used as a noninvasive tool in evaluating patients with portal hypertension.<sup>5</sup>

In a study conducted in china on 42 patients, spleen stiffness was

significantly higher in patients with esophageal varices ~ 2.7 to 3.3 m/s when compared to control group~ 0.9 to 1.3 m/s. Similar conclusion was given by bota s et al in a study conducted on 145 newly diagnosed cirrhotic patients where spleen stiffness is higher in ascites than in patients with esophageal varices.<sup>6</sup>

In multivariate analysis with a follow up period of 45 months conducted by Takuma y et al in 2017 on 393 patients with cirrhosis concluded that spleen stiffness was a independent parameter associated with mortality.<sup>7</sup>

In a study conducted by Balakrishnan on US population with chronic liver disease in 2016 on 177 patients concluded that both liver and spleen stiffness is useful predictor in cirrhosis and portal hypertension.<sup>8</sup>

Pilot study conducted by Tomita h et al concluded that spleen stiffness using ARFI is a potential non invasive marker for liver fibrosis and esophageal varices<sup>9</sup>. Similar conclusion was also given by park j et al.<sup>10</sup>

In a study conducted on 82 patients had concluded that mean values of spleen stiffness in normal individuals were between 1.8 to 2.3 m/s and 2.6 to 3.6 m/s in cirrhotics.<sup>11</sup>

Study done by Chen et al concluded that ARFI spleen stiffness measurement is potentially useful as a single or adjunct predictor for staging of liver fibrosis.<sup>12</sup>

In a study conducted on 204 patients and 60 healthy individuals had concluded that spleen stiffness cut off value for predicting esophageal varices was 3.16 m/s and also ARFI can be used as a non invasive method for determining the presence of esophageal varices.<sup>13</sup>

Study conducted by Vermehren et al on 166 patients with chronic liver disease had concluded that ARFI spleen significantly correlated for diagnosis of esophageal varices and detection of complications in patients with cirrhosis.<sup>14</sup>

#### CONCLUSION:

Based on the review we have found that spleen stiffness can play key role in early determination of complications of chronic liver disease. This guides the physicians and surgeons in monitoring and modification of treatment; a step forward in promoting care for the patient.

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